



NORTH-WEST UNIVERSITY
YUNIBESITHI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT
VAALDRIEHOEKKAMPUS

Benodigdhede vir hierdie vraestel/Requirements for this paper:

Multikousekaarte/
Multi-choice cards:

☐

Nie-programmeerbare sakrekenaar/
Non-programmable calculator:

☐

Grafiekpapier/
Graph paper:

☐

Draagbare Rekenaar/
Laptop:

☐

Oopboek-eksamen/
Open book examination?

NEE/
NO

EKSAMEN/TOETS
EXAMINATION/TEST:

June Opportunity
2016

KWALIFIKASIE/
QUALIFICATION:

B.Com, B.Sc, B.Sc in IT

MODULEKODE/
MODULE CODE:

ITRI613

TYDSDUUR/
DURATION: 3 Hours + 30
Minutes

MODULEBESKRYWING/
MODULE DESCRIPTION:

Database Systems I

MAKS/
MAX: 120

EKSAMINATOR(E)/
EXAMINER(S):

AR BOTES

DATUM/
DATE: 10/06/2016

PROF D JORDAAN

TYD/TIME: 09:00

MODERATOR:

DR JE KOTZÉ

INSTRUCTIONS

1. Answer all the questions in the script provided.
2. Number the question clearly.
3. Please write neatly; if answer cannot be read then no marks may be awarded.

QUESTION 1

1.

- 1.1. At a high level, discuss the primary job responsibilities required of a database administrator (DBA). (3)
- 1.2. What is the difference between a data administrator and a database administrator? (3)
- 1.3. Name five requirements that must be planned for when installing a new DBMS? (5)

[11]

QUESTION 2

2. Explain in your own words what is wrong with the following SQL code for creating a relational table? (Do not approach this question from a syntax perspective)

```

drop table t1
Create table t1 (tim int, rem varchar(100))
select 86400
INSERT INTO t1 VALUES (1251781074, 'day1')
INSERT INTO t1 VALUES (1251781074 + 86400, 'day2')
INSERT INTO t1 VALUES (1251781074 + 2*86400, 'day3')
INSERT INTO t1 VALUES (1251781074 + 3*86400, 'day4')
INSERT INTO t1 VALUES (1251781074 + 4*86400, 'day5')

Select DATEADD(hour,-4,(dateadd(second ,tim, '1/1/1970'))), * From t1

DECLARE @StartDateTime DATETIME
,@EndDateTime DATETIME

SELECT @StartDateTime = '2009-09-02 00:57:54.000'
SELECT @EndDateTime = '2009-09-03 00:57:54.000 '

Select * from t1
Where
    DATEADD(hour,-4,(dateadd(second ,tim, '1/1/1970'))) >= @StartDateTime
AND DATEADD(hour,-4,(dateadd(second ,tim, '1/1/1970'))) <= @EndDateTime

```

[3]

QUESTION 3

3. DesignCorp (DC) is one of the most innovative and competitive BI companies to date. The started operation in 1970 implementing the relational database as a core for the business and business entities. They maintain a competitive edge by implementing the latest technologies word and most appropriate solutions. In 2016, DC decided to upgrade one of its legacy systems which were a data warehouse based systems to an OLAP system which would now handle production based data for real time feedback and analytics, they would like to implement commodity hardware to keep cost limited. Knowing the advantages of both shared-disk and shared nothing you have been contracted to provide input for this upgrade in choosing the most feasible solution.

- 3.1. Which of these two (shared-disk and shared nothing) would you choose and explain your selection for a feasible solution to the above scenario. (4)

After some redesign and not wanting to change business processes to much the company decided to maintain the old system by just upgrading it to newer technologies and maintaining the data warehouse.

- 3.2. Would you use the same selection as in 3.1 for phase two? Explain? (4)

[8]

QUESTION 4

4. IntelTech is a database hosting provider for large scale hosting of asset tracking databases. They implemented a MySQL Cluster 5.6 in 2008 and upgraded to MySQL Cluster 6.5 in 2015. Due to keeping a competitive edge MySQL released a new version MySQL Cluster 6.9 at the end of 2015. MySQL Cluster 6.9 now enables the functionality of doing spatial queries which should make asset tracking type queries more feasible. However these features have not been thoroughly tested. Its 2016 and the current DBA is eager to test and implement the new DBMS, however the company and some executives are afraid of the implications to the company. As a well know DBA in the field you have been consulted regarding this matter.

- 4.1. What questions would you pose the DBA regarding the upgrade? (3)
- 4.2. If this upgrade only poses minor fixes from the current DBMS, performance improvements and the spatial features, would you recommend the upgrade or not? (3)

[6]

QUESTION 5

5. Your DBMS vendor, MegaDataCorp, just announced the general availability of the latest and greatest version of MDC, the DBMS you use. MDC Version 9 supports several new features that your users and developers have been clamoring for over the past year. You are currently running MDC Version 7.3. Prepare a short paper discussing your plans for upgrading to MDC Version 9 and outline the potential benefits and risks of your upgrade plan.

[8]

QUESTION 6

6. Design a change request form (CRF) that you would like to implement in your organization for user to request changes to the database and DBMS. (10)

[10]

QUESTION 7

7. Faceless Data Incorporated (FDI) is a datacentre in the heart of South Africa. They provide hosting services to various businesses in South Africa, Southern Africa and Australia. As required by law each company signs a service level agreement with FDI and one important aspect is the Availability vs. Downtime section of this agreement. Due to the datacentre only located in SA, they have various levels for Availability vs. Downtime for each region based on the external infrastructure as seen from the table below.

Country	Availability	Downtime
South Africa	99.999%	5 minutes
Southern Africa	99.8%	1052 minutes
Australia	98%	10512 minutes

- 7.1. Dreamworld IT Solutions (DITS) is an Australian IT provider that makes use of FDI for hosting some of its customers websites. In 2012 a power outage in SA resulted in the backup generated of the datacenter to malfunction and various network hubs to disengage and thus leaving DITS in the dark costing the company R750 0000.00 for the 4 days of this disaster.

- 7.1.1. Based on the above knowledge does DITS have a basis to sue FDI based on the SLA? Explain? (3)

- 7.1.2. How does the above scenario related to the Southern Africa context? (2)

[5]

QUESTION 8

8. Draw a diagram to show a normal page split for a DBMS.

[5]

QUESTION 9

9. Compare the responsibilities of the DA, DBA and SA in relation with each of the following tasks.

- A. IT Infrastructure
- B. Analysis
- C. Design
- D. Data and metadata policy
- E. Development
- F. Testing
- G. Implementation
- H. Maintenance and tuning.

Use a table/figure to illustrate your answer.

[8]

QUESTION 10

10. Given two database servers in a particular company the following information is available concerning the Data Cache:

	Server 1	Server 2	Server 3	Server 4
Database I/O requests	4762234	2511	12321	3256588
Physical I/O's	3482912	2081	12221	1123244

10.1. Rank the servers in a table based on better cache efficiency? (Show calculations)

(4)

10.2. Under which circumstances or why would the highest ranking server in 10.1 have a better cache efficiency?

(2)

10.3. What assisted server 4 to have a better cache efficiency than the lowest ranking server in 10.1?

(2)

[8]

QUESTION 11

11. Given the following details answer the question which follows:

Tables: PROD = 100000+ Record / CUST = 10000+ Records / BRAND = 13 Records

MarinaSlip Table

slipid	marinanum	slipnum	lenght	rentalfee	boatname	boattype	ownernum
1	1	a1	40	3800	anderson ii	sprite 4000	an75
2	1	a2	40	3800	our toy	ray 4025	el25
3	1	a3	40	3600	escape	sprite 4000	ke22
8	2	3	25	2000	listy	dolphin 25	sm72
9	2	4	30	2500	mermaid	dolphin 28	bl72

10	2	5	40	4200	axxon ii	dolphin 40	no27
11	2	6	40	4200	karvel	ray 4025	tr72

Service Table

serviceid	slipid	category _num	description	status	esthours	spenthours	nextservice
1	1	3	air conditioner periodically stops with code indicating low coolant level. diagnose and repair.	technician has verified the problem. air conditioning specialist has been called.	4	2	2013-07-12
2	5	4	fuse on port motor blown on two occasions. diagnose and repair.	open	2	0	2013-07-12
3	4	1	oil change and general routine maintenance (check fluid levels, clean sea strainers etc.).	service call has been scheduled.	1	0	2013-07-16
4	1	2	engine oil level has been dropping drastically. diagnose and repair.	open	2	0	2013-07-13
5	3	5	open pockets at base of two stantions. eval6_owner accident caused damage to	technician has completed the initial filling of the open pockets. will complete the job after the initial fill has had sufficient time to dry.	4	2	2010-07-13
14	7	5	forward portion of port side. canvas leaks around zippers in heavy rain.	technician has scheduled repair.	6	0	2013-07-13
15	11	7	install overlap around zippers to prevent leaks.	overlap has been created. installation has been scheduled.	8	3	2013-07-17

Owner Table

ownernum	lastname	firstname	address	city	state	zip
ad57	adney	bruce and jean	208 citrus	bowton	fl	31313
an75	anderson	bill	18 wilcox	glander bay	fl	31044
bl72	blake	mary	2672 commodore	bowton	fl	31313
no27	norton	peter	2811 lakewood	lewiston	fl	32765
sm72	smeltz	becky and dave	922 garland	glander bay	fl	31044
tr72	trent	ashton	922 crest	bay shores	fl	30992

- 11.1.1. Given the tables above, tabulate the table/columns which would you index if any and in each case why. (4)
- 11.1.2. Given the tables above, tabulate the table/columns which would avoid to index if any and in each case why. (3)
- 11.1.3. Which columns would you avoid to index at all costs? Why? (3)

[10]

{Written Examination Total: 82}

QUESTION 12

Using your database on the NWU Server (196.253.4.24) do the following:

1. Create the following table:

- a. Table: exa1_specimen_result
- b. Column:
 - i. SPECIMEN_ID
 - ii. PATIENT_ID
 - iii. LOCATION
 - iv. UDATETIME
 - v. RED_BLOOD_COUNT
 - vi. WHITE_BLOOD_COUNT
 - vii. OXYGEN_PERCENTAGE
 - viii. IRON_INDEX
 - ix. ALCOHOL_MIL
 - x. BLOODTYPE
 - xi. GENEPOOL

[12 Marks]

2. The following triggers should be created for inserting data or updating data in the table:

- a. All SPECIMEN_ID is greater than 100000.
- b. If WHITE_BLOOD_COUNT is more than 4000 then OXYGEN_PERCENTAGE should not be less than 50%.
- c. LOCATION can have only one of the following values GP, FS, ZN, WC, EC, NC, LM, NW, MP
- d. GENEPOOL is exactly 2 characters.
- e. RED_BLOOD_COUNT is only valid if the UDATETIME is from the last 24 hours. If more than 24 hours have passed it should default to 0.
- f. BLOODTYPE should be capitalized. (UCASE function can be used.)
- g. UDATETIME is an overall validation criteria if it is more than 72 hours then no data entry is to be made.

[(7 Marks (2 Runs)) = 14 Marks]

3. Create the following function:

- a. Name: exa1_pmt
- b. Parameters:
 - i. amount
 - ii. interest
 - iii. payments
 - iv. yeas
- c. This function must calculate the monthly instalment using the following formula:

$$\text{Monthly Payment} = \frac{\text{Loan Amount} * (r/n)}{\left(1 - \left(1 + \frac{r}{n}\right)^{-n*t}\right)}$$

r = interest rate

n = payments per year

t = number of years

d. Return the instalment.

[(4 Marks (2 Runs)) = 8 Marks]

4. Create the following function:

a. Name: exa1_random

b. Parameters: NONE

c. This function must generate a number between 0 and 10.

d. Return the integer.

[(2 Marks (2 Runs)) = 4 Marks]

- A note an automatic event will fire after submission date to back up your databases; as well as mark your assignments on the server. So any late submission will result in a 0 mark allocation.
- Not using the procedure names and parameters as stated above will also result in a 0 mark allocation.
- Please do not try to hardcode the output as I will be using different parameter values to expect different output.

{Practical Examination Total: 38}

TOTAL : 120